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ABSTRACT

A fixed-pace video-lesson which had adjunct questions (AQs) interspersed throughout was viewed by 134 freshman psychology students to determine if AQs have a facilitative effect on relevant and/or incidental learning from a videotape lesson, and, if they do, to discover the optimal combination of the factors of position and type of question, and feedback. Subjects viewed a videotape containing prequestions or postquestions of the knowledge or comprehension type, either with or without feedback. This yielded eight experimental treatment conditions, each with 13 subjects. A control group of 30 subjects which only viewed the videotape was also included. The results indicate that AQs have a facilitative effect on learning from videotape learning materials intended for viewing in a group. Total learning and relevant learning were enhanced by the addition of AQs to the videotape, while incidental learning was not affected. The results further suggest that AQs may function differently in a videotape than in a written prose text. Three tables of data and a 17-item bibliography are included. (CHC)

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The Effect of Adjunct Questions on Learning from a Videotape Lesson

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Abstract

University level psychology students viewed a fixed-pace video-lesson throughout which adjunct questions were interspersed. Subjects viewed a videotape containing prequestions or postquestions of the knowledge or comprehension type, either with of without feedback. This yielded eight experimental treatment conditions, each containing 13 subjects. A view-only control condition (n = 30) was added to the design. Analyses of variance and Dunnett's t-tests indicated (a) a general facilitative effect for adjunct questions on relevant learning and (b) no effect for adjunct questions on incidental learning. The results further suggest that adjunct questions may function differently in a videotape than in a written prose text.

The Effect of Adjunct Questions on Learning from a Videotape Lesson

When a person is confronted with a potential learning situation, what is learned not only depends upon that person's capabilities and the subject matter in question, but also largely depends upon the activities (mental or physical) in which the person engages, providing these activities are relevant to that learning situation (Anderson, 1970). The learner is an active participant in the learning process. This makes it not only possible, but also desirable to discover ways of managing and facilitating those activities which may influence or bring about learning.

Since the mid-1960's, when Rothkopf first introduced the concept of mathemagenic activities (Rothkopf, 1966) to describe those behaviors which give rise to learning, a great deal of research has dealt with the problem of stimulating the learner to participate more actively in his or her learning. Adjunct questions are considered to be one of the ways of evoking these learner activities, which in turn influence not only the learning of information directly related to the questions (relevant learning), but may also influence the learning of information in the text not directly related to the questions (incidental learning). A review of the theories related to this phenomenon can be found in Anderson and Biddle (1975), Faw and Waller (1976), Rickards (1979), and Rickards and Denner (1978).

Adjunct questions (AQ's) research has identified a number of factors that affect the way these AQ's function. Three such factors are question position, question type and feedback. Although the results are not always in agreement, AQ's have generally been shown to have certain facilitative effect on learning from written prose texts. This is no guarantee, however,

that this will also be the case when AQ's are interspersed throughout videotape learning materials.

Snow (1974) outlines three steps involved in making inferences from empirical data. These three steps are: generalization from the experimental sample to the accessible population from which it is drawn, generalization from the accessible population to the target population with which the researcher is ultimately concerned, and generalization with respect to the substantive phenomena under study. In previous AQ research, the substantive phenomena under study were the learning and attentional processes which accompany reading. Different processes are involved in learning from videotape materials. First, information is transmitted through two different sensory modalities (i.e. aural and visual), thus requiring an integration of processing behaviors by the viewer. Second, when a videotape is used to present information to a group it has a fixed-pace as opposed to written prose texts whose pace is largely self-determined by the reader. This leads us to the following two questions which this experiment was designed to answer, namely:

1. Do AQ's have a facilitative effect on relevant and/or incidental learning from a videotape lesson?
2. If this is the case, what is the optimal combination of the factors question position, question type and feedback?

Method

Design

A 2 X 2 X 2 factorial design, using an analysis of variance was employed. The first factor was question position (prequestions vs. postquestions), the second factor was question type (knowledge questions vs. comprehension questions), and the final factor was

feedback (without feedback vs. with feedback). A view-only control condition (without AQ's) was included in the design as a baseline condition with which the effects of the various treatments could be compared. A Dunnett's t-test was used to compare the control group to all experimental groups.

Subjects

Subjects were 134 freshman psychology students who must participate in a certain number of experiments as a part of their course requirements. Each subject was randomly assigned to one of the nine conditions, such that each of the eight experimental conditions contained 13 subjects and the view-only control condition contained 30 subjects.

Materials

The learning material consisted of a 75-minute videotape about Jena-plan education (Kirschner, Note 1), an educational system developed by Peter Petersen at the University of Jena, G.D.R., in the 1920's. This videotape was divided into 10 approximately equal segments, each dealing with a distinct aspect of this educational system. For each segment, five to eight questions were generated, yielding a total of 72 potential AQ's. Of these 72 questions, half were constructed as knowledge-type questions and the other half comprehension-type questions (Anderson, 1972; Bloom, Hastings & Madaus, 1971). These questions were then evaluated by an expert group to determine which were really knowledge questions and which were comprehension questions. On the basis of this evaluation, 10 comprehension AQ's and 10 knowledge AQ's (one of each type from each segment) were chosen. The remaining 52 items were subjected to a transfer evaluation study to determine the extent to which

these items tested for incidental learning. On the basis of results of these two studies, the adjunct questions and the items for the criterion test were chosen.

The criterion test consisted of 40 items. Ten items of the knowledge type were multiple choice versions of the knowledge AQ's and measured relevant learning in the knowledge AQ conditions. Ten items of the comprehension type similarly served to measure relevant learning in the comprehension AQ conditions. The remaining 20 items, 10 of the knowledge type and 10 of the comprehension type measured incidental learning for all subjects.

A questionnaire consisting of 17 items was constructed to gather information about the subjects and their reactions to the treatments. The first eight questions dealing with educational background, prior knowledge of Jena-plan education, attitudes towards the videotape and attitudes towards the subject matter were administered to all subjects. The following five items dealing with reactions to the AQ's were administered only to the subjects in the experimental conditions. Finally, the last four items dealing with reactions to the presence of feedback were administered only to those subjects in the 'with-feedback' conditions.

Format of the AQ's and Feedback

During the presentation of the videotape, the action stopped for the presentation of the AQ's, either directly preceding or directly following the relevant segment. The presentation of the AQ's (and where relevant, the feedback) went as follows. Subjects were first shown a few key words from the AQ to be presented on the monitor. After 10 seconds the AQ was presented via the sound track with the key words remaining visible on the screen. This was then

followed by 20 seconds of silence during which the key words remained in view. This was to allow the subjects the time to reflect upon the question. At the end of this time period, the videotape continued. The feedback (answers) was presented in a similar manner.

Procedure

Following a short introductory statement, each group of subjects viewed one of the nine versions of the videotape. All groups were instructed to view the tape carefully and were informed that a questionnaire would follow the viewing. No mention was made of the criterion test. All eight experimental treatment groups were informed of the presence, position and format of the AQ's. The subjects in the "with-feedback" conditions were also informed of the presence, position and format of the feedback. With the addition of the AQ's and feedback, the lengths of the videotape for control, "without feedback" and "with feedback" conditions were 75-, 82 and 89 minutes respectively.

Following the viewing of the videotape, each subject received a test booklet containing the criterion test and the questionnaire. Upon completion of the criterion retention test, each subject proceded directly to the questionnaire.

Results

Relevant item score

If we compare the overall mean of the four knowledge AQ conditions on the, for them, relevant items ($\bar{x}$ = 8.73, N = 52) with the control condition for those same items ($\bar{x}$ = 7.10, N = 30), then we find a significant difference between these two groups, t (82) = 1.79, $p < 0.001$. (maximum score = 10).

Further, a Dunnett's t-test comparing the means of the individual conditions yields significant differences between all four of the experimental conditions and the control condition (see table 1).

Insert Table 1 about here

If we compare the overall mean of the four comprehension AQ conditions on the, for them, relevant items ($\bar{x}$ = 7.25, N = 52) with the control condition for those same items ($\bar{x}$ = 5.60, N = 30), then we find here also a significant difference, t (80) = 3.94, $p < .001$. A Dunnett's t-test here shows that two of the four separate conditions significantly outscored the control conditions. Those conditions were the "with-feedback" conditions (see table 2).

Insert Table 2 about here

Two way analyses of variance revealed a significant main effect for feedback for both the knowledge- and the comprehension conditions, F (1,48) = 35.19, $p < 0.01$ and F (1,48) = 9.65, $p < .001$ respectively. The interactions were not significant.

Incidental item score

Incidental learning, for both the knowledge- and comprehension-type AQ conditions, was neither enhanced nor impaired. Neither the knowledge, nor the comprehension AQ conditions as a whole (N = 52) nor any of the separate treatment conditions (N = 13) differed significantly from the control condition on the incidental item score (maximum score = 30). Two-way analysis of variance revealed neither significant main effects nor significant interaction effects.

A noteworthy deviation from those results was the facilitation of question-type specific incidental learning in the knowledge AQ conditions. That is to say, the knowledge AQ conditions as a whole (N = 52) significantly outscored the control condition (N = 30) on the factual incidental items, t (80) = 2.09, $p < .025$.

Total score

A student's t-test was used in comparing the eight experimental treatment conditions as a whole with the control condition to determine whether or not there was a general facilitative effect for AQ's. There was a significant effect of AQ's, t (132) = 2.20, $p < 0.5$, for the total score (TOTSC) on the criterion test. Although all eight experimental treatment conditions individually outscored the control group on TOTSC (see Table 1), a Dunnett's t-test revealed no significant differences between any one condition and the control condition.

Insert Table 3 about here

A three-way analysis of variance on TOTSC for AQ type, AQ position, and the presence or absence of feedback yielded neither significant main effects nor significant interaction effects.

Questionnaire

The most important conclusions to be drawn from the questionnaire are that: (a) the entering behavior, prior education and knowledge of the subject matter for all of the conditions was similar, (b) the subjects (N = 134) felt that the videotape was interesting (82%), was clear (78%), did not contain too much information (98%), and was not paced too rapidly (98%); (c) the subjects in the experimental

treatment conditions (N = 104) did not experience the AQ's as inhibitive (90%), did not find the AQ's too difficult (98%), were not hindered by the interruption of the videotape for the presentation of the AQ's (81%) and attempted to answer the AQ's (88%); and (d) the subjects in the experimental treatment conditions receiving feedback (N = 52) experienced the feedback as facilitative (88%), attempted to answer the AQ's before the feedback was given (90%) and found that their answers generally agreed with the feedback given (83%).

Discussion

The results of the present study support the hypothesis that AQ's have a facilitative effect on learning from videotape learning materials intended for viewing in a group. Total learning and relevant learning were enhanced by the addition of AQ's to the videotape, while incidental learning was not affected. This result is in keeping with results of much of previous AQ research dealing with written prose texts. The difference between the results obtained here, and most results from research using written prose texts is the almost equivalent functioning of prequestions and postquestions, with prequestion groups fairing slightly, though not significantly better. Also, it is noteworthy that although the feedback groups did outscore the non-feedback groups, the difference was minimal. This leads us to the conclusion that those results found for AQ's in written materials may not be directly extrapolated to a video situation.

We have previously mentioned two important differences between text and the material used in this experiment. Our video material requires an integration of sensory modalities and presents information in a fixed-pace format. Yet another difference concerns the density and

frequency of AQ's. In research using texts, researchers have determined that the effects of the AQ's are greatest when they are interspersed at intervals of one of two paragraphs (Frase, 1968; Frase, Patrick & Schumer, 1970) and that the facilitating effects of AQ's decreases steadily as the amount of material between AQ's is increased (Eischens, Gaite & Kumar, 1972). It is highly probable that if these same guidelines were followed in videotape materials, the resulting material would be a confusing mass of interruptions rather than a continuous, informative whole.

A fourth major difference, and one that is investigated here, is the effect of question position on learning. It is generally accepted that postquestions yield the most favorable results on learning, particularly incidental learning. It has been proposed that the reason for this difference is that prequestions serve as discriminative cues. According to this hypothesis subjects in the prequestion conditions tend to spend most of their reading time searching the text for the question relevant information. Post-questions control learning contingencies, and thus encourage subjects in the postquestion conditions to develop reading and processing skills which result in more careful inspection of the text. Behaviors that result in successful answering of the AQ's are enhanced, while those that result in failure are extinguished (Glaser & Resnick, 1972; Sagaria & Di Vesta, 1978). The temporal nature of videotape instruction renders impossible the skimming of the material with the intention of finding the information necessary for answering the AQ. It is possible, however, that subjects in prequestion conditions stop attending to the video material as soon as the answer to the AQ has

been encountered. The test used in this experiment does not admit a check on this hypothesis. Further, one must take into account the fixed-pace, continuous nature of videotapes used to present information to a group. When reading a written text, the reader may pause at any time to rest, to reflect upon the subject content, upon the AQ or both, until he or she decides to proceed. The videotape we used allows a certain amount of time for thought after each AQ, but when this time has elapsed, the videotape continues, whether the viewer is ready or not. This is especially critical for those in the postquestion conditions. When a viewer is still trying to answer the question at the time the tape continues, he/she has two options. One option is to continue viewing the videotape and thus not answer the question. The other option is to continue pondering the question, thus ignoring (and missing) new information present in the videotape. Each of these choices has a deleterious consequence. For the former, the viewer may become frustrated due to the inability to answer the AQ('s) which could result in a decrease in the level of the viewer's motivation. For the latter, the viewer may miss an important piece of information in the following segment, thus decreasing both the educational value of the videotape as well as the viewer's ability to answer the next AQ. This problem, while very important in the case of postquestions, should be virtually nonexistant for prequestions. This, plus the previously mentioned inability to search the material may explain why subjects in the prequestion conditions proved to have scored the highest on the relevant and total learning measure while experiencing no impairment on the incidental learning measure.

Conclusion

The conclusion which may be drawn from this experiment is that AQ's have both a specific (relevant) effect and an overall (total) effect on learning from a videotape lesson, but one which is probably different from prose texts. Contrary to the results summarized by Anderson & Biddle (1975) in which they state that postquestions were more facilitative than prequestions, there was little difference to be found for this treatment. As was stated earlier, this is possibly due to the fixed-pace temporal quality of the videotapes.

Further, there was neither a positive nor a negative effect for the prequestions on incidental learning. This is also contrary to those results usually obtained from AQ research. This too may very well be the result of differing search and processing techniques employed for fixed-pace video instruction as opposed to written prose texts. Since scanning is not possible in a fixed-pace videotape, the cueing function suggested by Rothkopf (1971) in which the learner, informed as to what is important, searches the passage for the answer and disregards the incidental content is not a possibility. What is possible is that the incidental content following the answer may be disregarded, but not that preceding the answer.

Further, the results obtained do not lend themselves to a statement as to what the optimal combination of AQ factors may be. The differences between the experimental treatments do not approach significance.

These results very poignantly show that direct transfer of results obtained for certain techniques from one medium to another is a risky practice to say at the least. The characteristic differences between media must be kept explicitly in mind before one can attempt to make this transfer. Further research will hopefully shed more light on this question.

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Table 1

Dunnett's-t for the knowledge relevant items

	Control	Prequestions with feedback	Postquestions without feedback	Prequestions with feedback	Postquestions without feedback
$\bar{X}$	7.30[a]	9.54	9.31	8.23	7.85
sd	1.36	.66	.95	.73	.99
t		10.14	9.09	4.19	2.44
P		.001	.001	.001	.05

Note. N per condition = 8, maximum score = 10.

[a] The actual mean was 7.40 and standard deviation was 1.40 (N = 30). Dunnett's-t requires equal cell frequencies. To achieve this, a random sample was selected by the computer.

Table 2

Dunnett's-t for the comprehensions relevant items

	Control	Postquestions with feedback	Prequestions with feedback	Prequestions without feedback	Postquestions without feedback
$\bar{X}$	5.77[a]	8.08	7.85	6.62	6.46
sd	1.86	1.55	2.08	1.50	1.39
t		3.63	3.28	1.42	1.18
p		.005	.005	n.s.[b]	n.s.[b]

Note. N per condition = 13, maximum score = 10.

[a] see nota a, table 1. $\bar{X}$ and sd for N = 30 is 5.60 and 1,94 respectively

[b] not significant

Table 3

Means and standard deviations for total score

	With Feedback		Without Feedback		Control[b]	
	$\bar{X}$	s.d.	$\bar{X}$	s.d.	$\bar{X}$	s.d.
Prequestions						
Knowledge	28.85	2.82	28.00	3.51		
Comprehension	26.46	5.67	27.92	4.19		
Postquestions					25.73	4.43
Knowledge	27.92	3.35	27.46	2.73		
Comprehension	27.37	3.84	26.31	3.73		

Note. N per condition = 13.

[a] Maximum score = 40

[b] N = 30